The Vascular Flora of Hopewell Culture National Historical Park,

Ross County, Ohio

A Report for the
National Park Service

by the

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SUMMARY

Hopewell Culture National Historical Park is a unit of the United States National Park Service located in south central Ohio in Ross County, which was created to restore, protect, and interpret the legacy of the mound building Hopewell prehistoric peoples. The plant flora of the park had been estimated to be only 20% known prior to the undertaking of this project. During the spring and summer of 1995, almost 700 plant specimens were collected by three investigators from five units of the park. The specimens were identified, pressed and deposited in the park herbarium. A total of 438 species, 281 genera, and 93 families of vascular plants were discovered, representing 40% of the flora of Ross County, and 17% of the flora of Ohio. The park's flora is considered to be approximately 92% complete as a result of this study. Sixty-five species are new records for Ross County. Two species of special concern were discovered. *Spiranthes ovalis* and *Eleocharis ovata*, members of the orchid and rush families respectively and found in the Mound City and Hopewell units, are on the state's threatened and endangered species list. The Hopewell unit had the highest plant diversity of the five units. Three older plant checklists and the specimens in the park herbarium were checked and some of them are hereby excluded from the final list for various reasons. The plant checklist in this report supersedes all previous lists.

ACKNOWLEDGMENTS

This project would not have been possible without the generous cooperation and support of J. Neal, Superintendent of Hopewell Culture National Historical Park and R. Burgoon, Chief of Interpretation and Resource Management. Their efforts to make J. Course's stay at the park enjoyable are most appreciated. In addition, M. Walton, Director of the Veterans Affairs Medical Center is to be thanked for making accommodations available throughout the summer and for ensuring J. Course's safety.

Botanical assistance in projects like this is invaluable. The field assistance of J. McMahon and D. Minney contributed greatly to the spring flora as well as numerous identifications throughout the season. Identifications were also made by J. Furlow and several graduate students of the Ohio State University Herbarium, T. Cochrane of the University of Wisconsin Herbarium, and A. Cusick, Chief Botanist of the Ohio Division of Natural Areas and Preserves of the Ohio Department of Natural Resources. We also checked the identification of the *Spiranthes* orchid with J. Hapeman of the University of Wisconsin Herbarium.

INTRODUCTION

Hopewell Culture National Historical Park (HCNHP) is a unit of the United States National Park Service located in south central Ohio in Ross County. It was created to restore, protect, and interpret the legacy of the mound building Hopewell, a name for a group of prehistoric Native American peoples and cultures existing approximately 2,200 to 1,500 years ago. The park is nationally significant because it contains some of the few remaining Hopewell earthworks in the world. However, it also contains sufficient areas of land with natural vegetation. Prior to this study, three partial plant checklists and some plant specimens in the park herbarium constituted the known research on plant species in the park. As of 1994, about 85 plant species had been recorded in the park and Allison Cusick of the Ohio Department of Natural Resources estimated this number of species to be about 20% of the total probably there. This made the park's flora the least known flora of any national park in the midwestern region (Bennett, 1995). Recent floristic work in the region consists of the flora of unglaciated southeastern Ohio, including Ross County (Cusick and Silberhorn, 1977), and a flora of Fort Hill State Memorial in adjacent Highland County (Braun, 1969). The current study aimed to correct this lack of knowledge of HCNHP's flora with several goals in mind: (1) to investigate the presence of federally and/or state threatened, endangered species; (2) to gain a better understanding of the park's habitats and the diversity they may contain; (3) to provide biodiversity information to assist future park management; and (4) to contribute to the knowledge of Ohio's flora and the floras of parks in the midwestern region.

Geological Setting

Ohio's geology and geomorphology has been extremely influenced by several glaciation events of the Pleistocene that came into Ohio intermittently over a period of hundreds of thousands of years. The glaciers scoured out some areas and deposited heavy piles of drift in others, resulting in the terrain and soil types different than that of the unglaciated region of Ohio. Part of the furthermost glacial boundary lies just south of Hopewell Culture National Historical Park. The unglaciated terrain to the southeast of the boundary is more diverse and is composed of primarily non-calcareous soil. To the northwest of the glacial boundary, the landscape has been leveled by the massive forces of glaciers. In addition, the calcareous soil type is primarily the result of glacial till depositions.

Vegetation

Ohio's vegetation is summarized by L. Braun in *The Woody Plants of Ohio* (1989). Ross County and more specifically Hopewell Culture NHP are situated on a major dividing line running NE/SW between two "...phytogeographic regions in Ohio." HCNHP lies on the fringe of the "...southern nonglaciated area of the Allegheny Plateau," a much longer established undisturbed plant community than that to the northwest of HCNHP, "...the Miami region, mainly a calcareous, glaciated till plain." created by the last glaciers in Ohio, the Late Wisconsin glaciations. Because of this phenomenon the flora of central Ross Co. is likely to be richer than the surrounding area, everything else being equal.

Hopewell Culture's position on a glacial boundary has great significance as to what plants occur there. The advance of the glaciers into Ross County is mainly responsible for the topography, underlying rock, and soil types of today which are different than that to the south of the boundary. Vegetation has had to reestablish itself in once glaciated areas; whereas vegetation of the nonglaciated regions have a completely different history. Because HCNHP lies near the meeting point of two plant communities, its floral diversity is potentially high. However, human disturbances have had major influences on the park's vegetation.

Park History

The park was established in 1923 by Presidential proclamation as Mound City Group National Monument. Mound City was set aside as "...an object of great historical and scientific significance [that] should be permanently preserved and protected from all depredations and from all changes that will to any extent mar or jeopardize their historic value..." The Mound City Group is now one unit out of the five authorized units making up Hopewell Culture National Historical Park, which was established by public law in 1992.

Hopewell Culture has a long history of human disturbance. The first park unit, Mound City Group, was originally a military base (the War Department's Camp Sherman) before being transferred to the National Park Service. Barracks and training facilities were removed to restore the mounds. Most of the Hopewell Mound Group unit's land has been farmed at one time and still is today. As a historical park, Hopewell Culture's priority has been to protect Hopewell archeological resources. The park's long term objectives include restoring park land to the historic landscape. However, lack of research and funds have impeded that work. In many instances, maintaining areas as hayfields prove to be the least damaging to earthworks and other artifacts and the least costly. Therefore, a large percentage of HCNHP is managed for this habitat.

Park Description

The five units of Hopewell Culture NHP are High Banks, Hopewell, Hopeton, Mound City, and Seip (Fig. 1). In 1995, the designated acreage was 1,134, of which 404 is federal land and the remainder non-federal. The separate units are all located in Ross County with the greatest distance between any one unit being approximately 25 miles. At this time, only Mound City and Hopeton have been fully acquired. Depending on available funds, the other three sites will be purchased at some time possibly within the next ten years. Each of the five units are slightly different, and are described below.

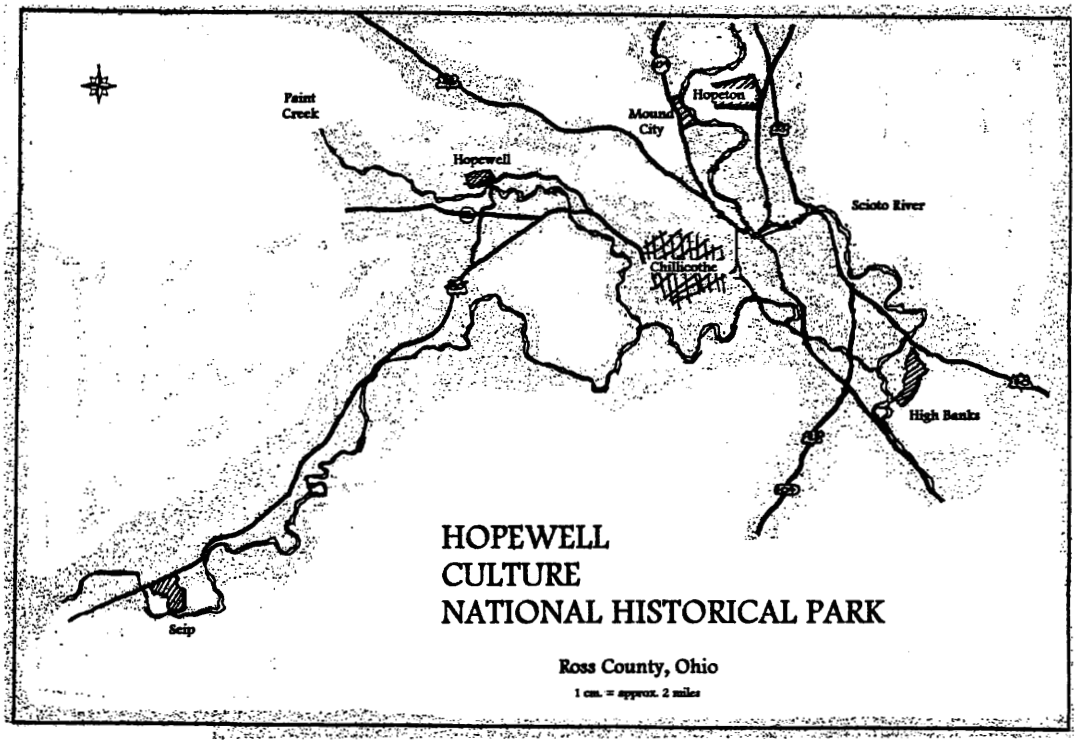

Figure 1. Map of Hopewell Culture National Historical Park

High Banks

This unit is located in Liberty Township approximately 10 miles south of the Mound City Group. HCNHP plans to acquire approximately 197 acres at this unit. Much of the acreage at High Banks is under agriculture, primarily as fields of alfalfa occasionally mowed for hay. A riparian woodland exists on the steep banks of the Scioto River to the west of the proposed unit boundary. The steep slopes leading down to the Scioto do not support a rich understory. Primarily exotic herbs and shrubs occupy the understory slopes.

Hopewell Mound Group

Hopewell is located in Union Township approximately six miles west of Mound City. This site is currently owned by the Archeological Conservancy and other private landholders and it is uncertain exactly how much of the area will be purchased for the park. The acreage proposed to be purchased is 202 acres. Hopewell contains a mixture of plant habitats. Approximately 130 acres is planted in alfalfa, while approximately another 72 is semi-mature mixed mesophytic forest. In contrast to the forests in Mound City, as a more mature forest, this area is less plagued with invasive weed species than the other areas and sites. An infrequently used, unpaved road cuts through this forest and extends eastward into a recently logged area. Abundant spring rains flood this area and the water is retained in small pools partially created with the formation of the road. This habitat is unique in the park. In total, approximately 20 acres (not included in present proposed boundaries) of additional forest was harvested and a logging road cuts through the middle of this area. There is a small dammed shallow pond approximately 1/3 acre in area near the northern Hopewell unit boundary which supports some aquatic species.

Hopeton

Hopeton, located in Springfield township, is 293 acres in area. Hopeton is less than one mile east of the Mound City Unit on the other side of the Scioto River. Approximately 230 acres of the Hopeton Unit is former farmland periodically mowed for hay. Another 36 acres is a black walnut grove. The remaining acreage is an early successional mixed deciduous open forest and interspersed with thickets and shrubby areas. A small intermittent stream runs through the southeast area of Hopeton and supports some aquatic species.

Mound City

Mound City is located in Union Township and consists of 120 acres. The fast flowing Scioto River acts as the unit's eastern boundary. Approximately 30 acres of this unit is a mowed lawn primarily around the earthworks, the visitor center and the administration building. Another 45 acres is a field mowed periodically for hay on the northern half of the park. The last 45 acres is mostly an early successional mixed mesophytic forest left to grow from field approximately twenty years ago. As an early successional forest, the canopy is still quite open, allowing light to enter, thereby promoting a very thick understory of weedy herbaceous and woody species. Many invasive species dominate this young forest. Their threat will hopefully diminish as the forest matures. A more mature riparian plant community exists along the Scioto River. Mound City receives as many as 37,000 visitors annually.

Seip

Seip is located in Paxton Township approximately 20 miles southwest of Mound City. HCNHP plans to acquire 120 acres, almost all of which is under constant human disturbance primarily through agriculture and mowing for esthetics and to preserve the archeological integrity of the site. The least human manipulated area occurs on a small parcel of property adjacent to Paint Creek. In this approximate 3 acre strip, there stand two abandoned houses in an infrequently mowed lawn with numerous planted ornamentals. This area also contains a mature riparian woodland which borders the mowed area to the North. There also exists a very small tallgrass prairie which will soon be overtaken by the forces of succession (primarily by *Juglans nigra* L.) if not burned in the near future. This specific site is unique because of the number of plant communities packed into a small area, and it therefore supports a high diversity of species.

METHODS

The taxonomic scope of this survey included all herbaceous and woody, terrestrial and aquatic, angiosperms, gymnosperms, and pteridophytes, subject to some exclusions (see below). The field season ran from 15 March, 1995 to 13 October, 1995. The objective was to collect at least one specimen with reproductive parts of every naturally established plant species occurring within existing and/or proposed park boundaries. Efforts were made to cover as much territory as possible within the designated survey boundaries, and to check sites periodically for new reproducing plants. Plants not flowering were noted and were returned to later. The following information was recorded with each specimen: locality, habitat, elevation, collection date, and water drainage basin.

Relative abundance was determined later for each species collected, using a three level abundance scale modified from Palmer et al.'s 1995 five rank scale:

Common:	Dominant or codominant in one or more common habitats, or easily seen or found in one or more common habitats but not dominant in any common habitat.
Intermediate:	Widely scattered but not difficult to find.
Rare:	Difficult to find with few individuals or colonies but found in several locations, or very difficult to find and limited to one or very few locations or uncommon habitats.

In addition, for each species, presence at other units (frequency) was noted periodically in order to determine occurrences throughout the park. Lastly, the origin (native or introduced) of each species was recorded as determined by Gleason and Cronquist (1991).

Because it was uncertain how much land HCNHP will purchase from the unacquired Hopewell, Seip, and High Banks units, some acreage was surveyed outside the currently proposed park unit boundary. Also in some units, land was excluded from the survey because it was still under agriculture. The total acreage *surveyed* at each site was as follows: High Banks: 8, Hopewell: 247, Hopeton: 155, Mound City: 120, and Seip: 53. The grand total area surveyed was 583 acres. Acreages were estimated using Department of Interior property maps.

Out of the approximate seven month field season, there were 82 field collecting days, with the majority of them occurring June through September. Size and habitat complexity were primary factors in determining frequency and length of visits to the five different units. The total number of collecting visits to each park unit were the following: High Banks: 7, Hopewell: 34, Hopeton: 29, Mound City: 41, and Seip: 13.

Joe McMahon, an experienced amateur botanist, and David Minney of The Nature Conservancy collected in three of the units, pressed, and identified their specimens in the beginning of the field season from 15 March to 20 May. The Seip and High Banks units were not sampled during this time.

From 31 May, 1995 to the end of the field season, specimens were collected by Jennifer Course, who identified most of these specimens except for many of the specimens of the *Cyperaceae* and *Poaceae*, which D. Minney identified. Other assistance with identification was provided by J. Furlow and students at the Ohio State University Herbarium, and A. Cusick of the Ohio Department of Natural Resources.

Specimens were identified using the following references: Cooperrider (1995), Britton and Brown (1970), Braun (1989), Braun (1967), Cobb (1963), Courtenay and Zimmerman (1978), Fisher (1988), Hitchcock (1935), Gleason and Cronquist (1991), Newcomb (1977), Petrides (1972), Weishaupt (1971), and Catling (1983). The nomenclature of the specimen and museum record labels is that of Gleason and Cronquist (1991).

A total of 686 specimens were collected for this study. Specimens were pressed, dried and deposited with NPS Herbarium Labels in the HCNHP museum collection at park headquarters. The specimens are unmounted and are stored in collection number sequence. NPS Museum Catalog Records forms were also completed and deposited at the park. A complete set of voucher specimens for every species was deposited at the park and duplicates were donated to the Ohio State University Herbarium in Columbus (OS). Ten specimens were unidentified.

Three species were observed and recorded in the 1995 field season but were not collected. *Asparagus officinalis* L. was thought to be collected but no specimen has been found. *Monotropa uniflora* L. was not collected because only one plant was found. *Toxicodendron radicans* (L.) Kuntze was not collected because of toxicity and a specimen collected by Carl Roth in 1976 was found in the park's collection.

Three plant lists for the park were located at the park and reviewed. Carl Roth collected specimens and compiled a list in 1976, but after examining them it was found that several were misidentified. Anna Shoemaker in 1988 compiled a list of wildflowers accompanied with photographs displayed at the park's visitor center. A third more recent list was created by Joe McMahon but no specimens were collected.

Palmer's standards for writing floras (1995) were adhered to as much as possible for this study.

Excluded Taxa

Several taxa were excluded from the final list of park flora for one of three reasons: (1) they were listed on earlier flora checklists but they were not found during the 1995 field season; (2) they were determined to be planted and not reproducing; or (3) they were varieties that were not distinguished on the HCNHP flora list.

The following species from C. Roth's 1976 list are excluded:

Carya tomentosa (Poiret) Nutt.
Geum virginianum L.
Matelea obliqua (Jacq.) Woodson
Paulownia tomentosa (Thumb.) Steudel
Potentilla simplex Michx.
Rudbeckia lacinata L.
Solanum rostratum Dunal
Zizia sp.

The following species from Anna Shoemaker's 1988 list are excluded:

Allium stellatum Ker Gawler
Brassica rapa L.
Cardamine concatenata (Michx.) O. Schwartz
Cirsium altissimum (L.) Sprengel
Eupatorium fistulosum Barratt
Rubus hispidus L.
Rubus villosus (sic)
Saxifraga bronchialis L.
Trifolium repens L.
Verbena stricta Vent.
Veronica filiformis J. E. Smith
Viola blanda Willd.

The following species from J. Mc Mahon's 1993 list are excluded:

Allium canadense L.
Arabis hirsuta (L.) Scop.
Geranium bicknellii Britton
Geranium pusillum L.
Stellaria graminea L.
Trifolium aureum Pollich
Trifolium repens L.

The following species were determined to be planted and not reproducing and are therefore excluded from the HCNHP flora list:

Acer rubrum L.
Aesculus hippocastanum L.
Albizia julibrissin Durazz
Berberis thunbergii DC.
Broussonetia papyrifera (L.) Vent.
Fraxinus excelsior L.
Hibiscus syriacus L.
Koelreuteria paniculata Laxm.
Philadelphus inodorus L.
Philadelphus pubescens Loisel
Picea abies Karst.
Pinus nigra Arnold
Pinus resinosa Aiton.
Pinus strobus L.
Quercus coccinea Muenchh.
Quercus palustris Muenchh.
Syringa vulgaris L.
Thuja occidentalis L.
Triticum aestivum L.
Viburnum opulus L.

Some specimens were identified to the variety level. These are typically excluded from floras because of their uncertain taxonomic status. The species, however, are included in the park list.

Acer negundo var. *negundo* L.
Aster lanceolatus Willd. var. *simplex* (Willd.) A. G. Jones
Aster pilosus var. *pilosus* Willd.
Cardamine parviflora var. arenicola (Britt.) O. E. Schulz
Carex albicans var. *albicans* Willd.
Cercis canadensis var. *canadensis* L.
Chaerophyllum procumbens (L.) Crantz var. *shortii* T. & G.
Cirsium arvense (L.) Scop. var. *horridum* Wimmer
Conyza canadensis var. *canadensis* (L.) Cronq.
Erechtites hieracifolia var. *hieracifolia* (L.) Raf.
Eupatorium rugosum var. *rugosum* Houttuyn
Fraxinus americana var. *americana* L.
Fraxinus pennsylvanica Marshall var. *subintegerrima* (Vahl.) Fern.
Fraxinus pennsylvanica var. *pennsylvanica* Marshall.
Heliopsis helianthoides (L.) Sweet var. *scabra* (Dunal) Fern.
Humulus lupulus L. var. *pubescens* E. Small
Physalis longifolia Nutt. var. *subglabrata* (Mackenzie & Bush) Cronq.
Polemonium reptans var. *villosum* E. Braun
Polygonum cespitosum Blume var. *longisetum* (De Bruyn) Stewart
Polygonum scandens L. var. *dumetorum* (L.) Gleason
Prunella vulgaris L. var. *lanceolata* (Barton) Fern.
Rudbeckia hirta L. var. *pulcherrima* Farw.
Sagittaria latifolia var. *latifolia* Willd.
Solanum nigrum var. *virginicum* L.
Solidago gigantea Aiton. var. *leiophylla* Fern.
Spiranthes ovalis Lindl. var. *erostellata* Catling
Urtica dioica L. var. *procera* (Muhl.) Wedd.
Vernonia gigantea var. *gigantea* (Walter) Trel.
Vitis aestivalis var. *aestivalis* Michx.

VASCULAR PLANT SPECIES OF HOPEWELL CULTURE NATIONAL HISTORICAL PARK

The following table is sorted alphabetically first by family, then by genera and species. For each species, the Latin name is given, the botanical authority for the name, the vernacular name, whether the species is native or not (yes/no), its abundance on a three point scale (C = common, I = intermediate, R = rare), the units the species occurs in (HB = High Banks, HL = Hopewell, HN = Hopeton, MC = Mound City, and SP = Seip), and the collections numbers for the specimens.

Family	Species	Common name	Native	Abundance	Park Units	Collection Numbers
Acanthaceae						
	Justicia americana (L.) M. Vahl	American water willow	Yes	R	HB, MC, SP	JC0636
	Ruellia strepens L.	Smooth ruellia	Yes	I	HN, HL, MC, SP	JC0167
Aceraceae						
	Acer negundo L.	Box elder	Yes	C	HB, HN, HL, MC, SP	JC0006, JC0067
	Acer saccharinum L.	Silver maple	Yes	C	HB, HN, HL, MC, SP	JC0406
	Acer saccharum Marshall	Sugar maple	Yes	C	HB, HN, HL, MC, SP	JC0098, JC0421
Adiantaceae						
	Adiantum pedatum L.	Maidenhair fern	Yes	R	HL	JC0383
Alismataceae						
	Sagittaria latifolia Willd.	Common arrowhead	Yes	R	MC	JC0492a
Amaranthaceae						
	Amaranthus retroflexus L.	Red root pigweed	No	I	HB, HN, HL	JC0405
	Amaranthus tuberculatus (Moq.) Sauer.	Amaranth	Yes	R	MC	JC0619
Anacardiaceae						
	Rhus glabra L.	Smooth sumac	Yes	I	MC, SP	JC0290
	Rhus typhina L.	Staghorn sumac	Yes	I	HN, HL, MC, SP	JC0277, JC0165a
	Toxicodendron radicans (L.) Kuntze	Poison ivy	Yes	C	HB, HN, HL, MC, SP	CR0019
Annonaceae						
	Asimina triloba (L.) Dunal.	Paw paw	Yes	I	HB, HL, MC, SP	JC0314
Apiaceae						
	Chaerophyllum procumbens (L.) Crantz	Chervil	Yes	I	HL	DM0042
	Conium maculatum L.	Poison hemlock	No	C	HB, HN, HL, MC, SP	JC0115
	Cryptotaenia canadensis (L.) DC.	Honewort	Yes	C	HB, HN, HL, MC, SP	JC0317, JC0058
	Daucus carota L.	Wild carrot, queen anne's lace	No	C	HB, HN, HL, MC, SP	JC0205
	Erigenia bulbosa (Michx.) Nut.	Harbinger-of-spring	Yes	I	HL	JM0006
	Osmorhiza claytoni (Michx.) C. B. Clarke	Hairy sweet cicely	Yes	I	HL	DM0058

Osmorhiza longistylis (Torr.) D. C.	Smooth sweet-cicely	Yes	C	HB, HN, HL, MC, SP	JM0047
Pastinaca sativa L.	Wild parsnip	No	C	HB, HN, HL, MC, SP	JC0026
Sanicula gregaria E. Bickn.	Clustered snakeroot	Yes	C	HB, HN, HL, MC, SP	JC0460, JC0056, JC0431
Torilus arvensis (Hudson) Link	Field hedge-parsley	No	I	HB, HN, HL, MC, SP	JC0271
Apocynaceae					
Vinca minor L.	Periwinkle	No	I	MC	JM0004
Araceae					
Arisaema atrorubens (Ait.) Schott	Jack-in-the-pulpit	No	R	HL, MC	DM0032
Araliaceae					
Panax quinquefolium L.	American ginseng	Yes	R	HL	JC0318
Aristolochiaceae					
Asarum canadense L.	Wild ginger	Yes	I	HL, MC, SP	JM0041
Asclepiadaceae					
Ampelamus albidus (Nutt.) Britton	Sand vine	Yes	I	HB, HN, HL, MC, SP	JC0404
Apocynum cannabinum L.	Indian hemp	Yes	C	HB, HN, HL, MC, SP	JC0212
Asclepias incarnata L.	Swamp milkweed	Yes	R	HL	JC0367
Asclepias syriaca L.	Common milkweed	Yes	C	HB, HN, HL, MC, SP	JC0260, JC0307
Asclepias tuberosa L.	Butterfly weed	Yes	R	HN, SP	JC0278
Aspleniaceae					
Asplenium platyneuron (L.) Oakes	Ebony spleenwort	Yes	I	HL, MC, SP	JC0037
Polystichum acrostichoides (Michx.) Schott	Christmas fern	Yes	R	HL	JC0270, JC0374
Asteraceae					
Achillea millefolium L.	Yarrow	No	I	HB, HN, HL, MC, SP	JC0071
Ambrosia artemisiifolia L.	Common ragweed	No	C	HB, HN, HL, MC, SP	JC0424
Ambrosia trifida L.	Giant ragweed	Yes	C	HB, HN, HL, MC, SP	JC0356
Arctium minus Schk.	Common burdock	No	I	HB, HN, HL, MC, SP	JC0369, JC0346
Artemisia annua L.	Sweet wormwood	No	R	MC	JC0551
Artemisia vulgaris L.	Common mugwort	No	R	MC	JC0531
Aster cordifolius L.	Heart leaved aster	Yes	I	HN, HL, MC, SP	JC0587
Aster lanceolatus Willd.	Eastern lined aster	Yes	I	HL	JC0605
Aster lateriflorus (L.) Britton	Starved aster	Yes	I	HL	JC0608, JC0614
Aster novae-angliae L.	New england aster	Yes	I	HN, HL, MC, SP	JC0609, JC0596
Aster pilosus Willd.	Heath aster	Yes	C	HB, HN, HL, MC, SP	JC0500, JC0576
Aster saggitifolius Willd.	Arrow-leaved aster	Yes	R	HL	JC0494
Aster shortii Lindley	Short's aster	Yes	I	HB, HN, HL, MC, SP	JC0493, JC0610, JC0585
Bidens bipinnata L.	Spanish needles	Yes	R	HL, MC	JC0444

Bidens cernua L.	Nodding bur marigold	Yes	R	HL	JC0604
Bidens frondosa L.	Beggar's ticks	Yes	I	HL, SP	JC0510, JC0514
Bidens vulgata Greene	Tall beggar ticks	Yes	I	HL	JC0433, JC0477
Cacalia atriplicifolia L.	Pale indian plantain	No	R	SP	JC0474
Carduus nutans L.	Nodding thistle	No	R	HN	JC0083
Chrysanthemum leucanthemum L.	Ox-eye daisy	No	C	HB, HN, HL, MC, SP	JC0073a
Cichorium intybus L.	Chicory	No	C	HB, HN, HL, MC, SP	JC0360
Cirsium arvense (L.) Scop.	Canada thistle	No	C	HB, HN, HL, MC, SP	JC0080, JC0166
Cirsium vulgare (Savi.) Tenore	Bull thistle	No	C	HB, HN, HL, MC, SP	JC0293
Conyza canadensis (L.) Cronq.	Horseweed	Yes	C	HB, HN, HL, MC, SP	JC0434
Echinacea purpurea (L.) Moench.	Purple coneflower	Yes	R	MC	JC0299
Erechtites hieracifolia (L.) Raf.	Pilewort or fireweed	Yes	I	HL	JC0584
Erigeron annuus (L.) Pers.	Daisy fleabane	Yes	C	HB, HN, HL, MC, SP	JC0324, JC0561
Erigeron philadelphicus L.	Philadelphia fleabane	Yes	C	HB, HN, HL, MC, SP	JM0044, JM0064, JC0070, JC0082
Eupatorium altissima L.	Tall thoroughwort	Yes	R	HN	JC0556
Eupatorium coelestinum L.	Mistflower	Yes	I	HL, MC, SP	JC0455
Eupatorium perfoliatum L.	Boneset	Yes	I	HL	JC0457
Eupatorium purpureum L.	Trumpetweed	Yes	R	HL	JC0429
Eupatorium rugosum Houttuyn	White snakeroot	Yes	C	HB, HN, HL, MC, SP	JC0419, JC0377a, JC0543
Eupatorium serotinum Michx.	Late flowering boneset	Yes	R	HL	JC0583
Euthamia graminifolia (L.) Nutt.	Flat-topped goldenrod	Yes	I	HB, HL, MC	JC0502, JC0507
Gnaphalium obtusifolium L.	Fragrant cudweed	Yes	I	HB, HN, HL, MC, SP	JC0530
Helianthus tuberosus L.	Jerusalem artichoke	Yes	C	HB, HN, HL, MC, SP	JC0536
Heliopsis helianthoides (L.) Sweet	False sunflower	Yes	I	HL, SP	JC0298
Hieracium caespitosum Dumort	Yellow hawkweed	No	I	MC	JC0023
Kuhnia eupatoriodes L.	False boneset	Yes	I	HN, HL	JC0555
Lactuca canadensis L.	Wild lettuce	Yes	C	HN, HL	JC0272, JC0275
Lactuca floridana L.	Tall blue lettuce	Yes	C	HN, HL, MC, SP	JC0446
Lactuca serriola L.	Prickly lettuce	No	C	HB, HN, HL, MC, SP	JC0517
Matricaria maritima L.	Scentless chamomile	No	R	HN	JC0180
Matricaria matricarioides (Less.) Porter	Pineapple-weed	No	R	MC	JM0045
Polymnia canadensis L.	Small-flowered leafcup	Yes	C	HL, MC, SP	JC0243
Ratibida pinnata (Vent.) Barnhart	Gray-headed coneflower	Yes	R	SP	JC0310
Rudbeckia fulgida Aiton	Orange coneflower	Yes	I	HN, HL	JC0357, JC0373
Rudbeckia hirta L.	Black-eyed susan	Yes	R	HL, MC, SP	JC0266
Rudbeckia triloba L.	Three-lobed sunflower	Yes	I	HB, HN, HL, MC	JC0365
Senecio aureus L.	Golden ragwort	Yes	I	MC	JM0035
Senecio obovatus Muhl.	Squawweed	No	R	HN, HL, MC	JM0059, DM0071
Silphium perfoliatum L.	Cup-plant	Yes	I	HN	JC0352
Solidago canadensis L.	Common goldenrod	Yes	C	HB, HN, HL, MC, SP	JC0597, JC0623, JC0631, JC0589, JC0602a, JC0626a
Solidago flexicaulis L.	Zig zag goldenrod	Yes	R	HL, SP	JC0616
Solidago gigantea Aiton	Late goldenrod	Yes	I	HB, HN, HL, MC, SP	JC0552
Solidago juncea Aiton	Early goldenrod	Yes	I	HN	JC0397

Solidago rugosa Miller	Rough goldenrod	Yes	I	HB, HN, HL, MC, SP	JC0516, JC0502a
Sonchus asper (L.) Hill	Prickly sow-thistle	No	I	HB, HN, HL, MC, SP	JC0179, JC0495, JC0115
Taraxacum officinale Weber	Dandelion	Yes	C	HB, HN, HL, MC, SP	JM0008
Tragopogon pratensis L.	Yellow goat's beard	No	I	HB, HN, HL, MC, SP	JC0060
Verbesina alternifolia (L.) Britton	Wingstem	Yes	C	HB, HN, HL, MC, SP	JC0435
Vernonia gigantea (Walter) Trel.	Tall ironweed	Yes	C	HB, HN, HL, MC, SP	JC0442, JC0437, JC0525
Xanthium strumarium L.	Clotbur	Yes	I	HL, MC, SP	JC0499
Balsaminaceae					
Impatiens capensis Meerb.	Orange jewelweed	No	C	HB, HN, HL, MC, SP	JC0150
Impatiens pallida Nutt.	Pale touch-me-not	Yes	C	HB, HN, HL, MC, SP	JC0207
Berberidaceae					
Jeffersonia diphylla (L.) Pers.	Twinleaf	No	I	HL	DM0021
Podophyllum peltatum L.	Mayapple	Yes	I	HL, MC	JM0055, DM0061
Betulaceae					
Carpinus caroliniana Walter	Ironwood	Yes	R	SP	JC0392
Ostrya virginiana (Miller) K. Koch	Hop hornbeam	Yes	I	HL, MC, SP	JC0582
Salix nigra Marsh.	Black willow	Yes	C	HB, HN, HL, MC, SP	JC0501
Bignoniaceae					
Campsis radicans (L.) Seemann	Trumpet creeper	Yes	C	HB, HN, HL, MC, SP	JC0295a, JC0258
Catalpla speciosa Warder	Northern catalpa	No	R	HN	JC0177
Boraginaceae					
Echium vulgare L.	Blue-weed	No	R	HB	JC0264
Hackelia virginiana (L.) I. M. Johnston	Virginia stickseed	Yes	I	HL, MC	JC0381
Lithospermum arvense L.	Corn gromwwell	No	I	HN, MC	DM0012, JM0052
Mertensia virginica (L.) Pers.	Virginia bluebell	Yes	I	HL, MC	JM0009
Brassicaceae					
Alliaria petiolata (Bieb.) Cavara & Grande	Garlic mustard	No	C	HB, HN, HL, MC, SP	JC0065, JM0034
Arabidopsis thaliana (L.) Heynh.	Mouse-ear cress	No	I	HN	DM0008, JM0022
Arabis perstellata L. Braun	Rock-cress	Yes	I	SP	JC0104
Barbarea vulgaris R. Br.	Common winter cress (yellow rocket)	No	C	HB, HN, HL, MC, SP	JC0247, JM0032, JC0221
Berteroa incana (L.) DC.	Hoary alyssum	No	R	HB	JC0263
Brassica nigra L.	Black mustard	No	I	MC	JC0422
Capsella bursa-pastoris (L.) Medikus	Shepherd's purse	No	C	HB, HN, HL, MC, SP	JM0030
Cardamine douglasii Britton	Spring cress	Yes	I	HL	DM0003
Cardamine parviflora L.	Small-flowered bittercress	Yes	I	HN, HL	JM0005, DM0034
Draba verna L.	Whitlow grass	No	C	HB, HN, HL, MC, SP	JM0015, JM0016
Erysimum repandum L.	Treacle mustard	No	I	HN, HL	DM0011, JM0020

Hesperis matronalis L.	Dame's rocket	No	I	HN	JC0174, JC0400
Iodanthus pinnatifidus (Michx.) Stued.	Purple rocket	Yes	I	HL, MC, SP	JC0057
Lepidium campestre (L.) R. Br.	Field peppergrass	No	C	HB, HN, HL, MC, SP	JM0021
Lepidium virginicum L.	Peppergrass	Yes	I	HB, HN, HL, MC, SP	JC0215, JC0206
Rorippa nasturtium-aquaticum (L.) Hayek	Water-cress	No	R	HB, HN, HL	JC0193
Sisymbrium officinale (L.) Scop.	Hedge mustard	No	I	HB, HN	JC0238
Thlaspi arvense L.	Field penny-cress	No	C	HB, HN, HL, MC, SP	JM0049
Thlaspi perfoliatum L.	Perfoliate pennycress	No	C	HB, HN, HL, MC, SP	JM0060, DM0002
Caesalpinaceae					
Cercis canadensis L.	Redbud	Yes	C	HB, HN, HL, MC, SP	JC0015, JC0064
Campanulaceae					
Campanula americana L.	Tall bellflower	Yes	I	HN, HL, MC, SP	JC0289
Lobelia inflata L.	Indian tobacco	Yes	I	HB, HN, HL, MC	JC0228, JC0324a
Lobelia siphiltica L.	Great lobelia	Yes	I	HN, HL, SP	JC0452
Triodanis perfoliata (L.) Nieuwl.	Venus looking glass	Yes	I	HB, HN, HL, MC, SP	JC0092
Cannabaceae					
Humulus lupulus L.	Common hops	No	I	HL, MC	JC0598
Caprifoliaceae					
Lonicera japonica Thumb.	Japanese honeysuckle	No	C	HB, HN, HL, MC, SP	JC0054
Lonicera maackii (Rupr.) Maxim.	Honeysuckle	No	C	HB, HN, HL, MC, SP	JC0470a, JC0524, JC0538, JC0490, JC0537
Lonicera tartarica L.	Tartarian honeysuckle	No	C	MC	JC0533
Sambucus canadensis L.	Common elderberry	Yes	I	HN, HL	JC0226
Symphoricarpus orbiculatus Moench	Coralberry	Yes	I	HL, MC	JC0384
Caryophyllaceae					
Cerastium vulgatum L.	Mouse-ear chickweed	No	I	HN, MC	JM0029, JM0031
Dianthus armeria L.	Deptford pink	No	I	HB, HN, HL, MC, SP	JC0084
Saponaria officinalis L.	Bouncing bet	No	C	HB, HN, HL, MC, SP	JC0259
Silene antirrhina L.	Sleepy catchfly	Yes	I	HL	JC0173
Silene latifolia Poiret	White campion	No	C	HB, HN, HL, MC, SP	JM0042, JC0066, JC0355
Silene noctiflora L.	Night- flowering catchfly	No	R	SP	JC0165
Silene stellata (L.) Aiton. f.	Starry campion	Yes	R	HL, MC	JC0316
Silene virginica L.	Fire pink	Yes	R	HL	JC0136
Silene vulgaris (Moench) Garcke	Bladder campion	No	C	HB, HN, HL, MC, SP	JC0094, JC0188
Stellaria media (L.) Villars	Chickweed	No	C	HB, HN, HL, MC, SP	JM0014, JC0050
Celastraceae					
Celastrus scandens L.	American bittersweet	Yes	C	HN, HL, MC, SP	JC0214
Euonymus alatus (Thunb.) Siebold	Winged burning bush	No	R	MC	JC0302

Euonymus atropurpureus Jacq.	Wahoo	Yes	I	HB, HN, HL, MC, SP	JC0440, JC0178
Chenopodiaceae					
Chenopodium album L.	Lamb's quarters or goosefoot	No	C	HB, HN, HL, MC, SP	JC0358
Clusiaceae					
Hypericum mutilum L.	Small flowered St. John's wort	Yes	R	HL	JC0335, JC0332
Hypericum perforatum L.	Common St. John's wort	No	I	HB, HN, HL, MC	JC0356a
Hypericum punctatum Lam.	Spotted St. John's wort	Yes	I	HL	JC0389, JC0330, JC0315
Commelinaceae					
Commelina communis L.	Asiatic dayflower	No	I	HB, HN, HL, SP	JC0402
Convolvulaceae					
Calystegia sepium (L.) R. Br.	Hedge bindweed	No	C	HB, HN, HL, MC, SP	JC0257
Convolvulus arvensis L.	Field bindweed	No	I	HB, HL, MC	JC0133
Ipomoea hederacea Jacq.	Ivy-leafed morning glory	No	I	HB, HN, HL, MC, SP	JC0469a, JC0518
Ipomoea lacunosa L.	Small white morning glory	Yes	I	HB, HN	JC0466a
Ipomoea pandurata (L.) G. Meyer	Wild potato vine	Yes	C	HB, HN, HL, MC, SP	JC0274, JC0344
Cornaceae					
Cornus drummondii C. A. Meyer	Rough-leaved dogwood	Yes	R	HB, HN, MC	JC0032
Cornus florida L.	Flowering dogwood	Yes	I	HB, HN, HL, MC, SP	JC0416, JC0462
Cucurbitaceae					
Cucurbita pepo L.	Field pumpkin	Yes	R	HN	JC0520
Sicyos angulatus L.	Bur cucumber	Yes	R	MC	JC0618
Cupressaceae					
Juniperus virginiana L.	Red cedar	Yes	R	HN, MC	JC0559, JC0125
Thuja occidentalis L.	Northern White Cedar	yes			
Cyperaceae					
Carex albicans Willd.	Sedge	Yes	I	HL	DM0026, DM0037
Carex albursina Sheldon	Sedge	Yes	R	HL	DM0015
Carex amphibola Steudel	Sedge	Yes	R	HL, MC	JC0012, JC0341
Carex blanda Dewey	Sedge	Yes	R	HL	DM0038
Carex careyana Torr.	Sedge	Yes	R	HL	DM0039
Carex davisii Schwein & Torr.	Sedge	Yes	R	HL	JC0141
Carex festucacea Schkuhr.	Sedge	Yes	R	HL	JC0139, JC0154
Carex flaccosperma Dewey	Sedge	Yes	R	HL	JC0137
Carex gracillima Schwein.	Sedge	Yes	R	HL	JC0144
Carex hirtifolia Mackenzie	Sedge	Yes	R	HL	JC0148a
Carex jamesii Schwein.	Sedge	Yes	R	HL	DM0027

Carex laxiculmis Schwein.	Sedge	Yes	R	HL	DM0028
Carex retroflexa Muhl.	Texas sedge	Yes	R	SP	JC0107
Carex rosea Schk.	Sedge	Yes	R	HL	JC0140
Carex shortiana Dewey	Sedge	Yes	R	HL	JC0142
Carex squarrosa L.	Sedge	Yes	I	HN, HL	JC0378, JC0149
Carex stipata Muhl.	Sedge	Yes	I	HN, HL	JC0089
Carex vulpinoidea Michx.	Sedge	Yes	R	HL	JC0168
Cyperus esculentus L.	Yellow nut-sedge	Yes	I	HL	JC0305
Eleocharis ovata (Roth) Roemer & Schultes	Blunt spike-rush	Yes	R	HL	JC0147, JC0385
Scirpus atrovirens Willd.	Black bulrush	Yes	I	HL	JC0229
Scirpus lineatus Michx.	Bulrush	Yes	R	HL	JC0222a
Juncus tenuis willd	Path rush	yes			
Dipsacaceae					
Dipsacus sylvestris Hudson	Teasel	No	C	HB, HN, HL, MC, SP	JC0297
Elaeagnaceae					
Elaeagnus angustifolia L.	Russian olive	No	R	HN, HL	JC0465a
Equisetaceae					
Equisetum arvense L.	Horsetail	Yes	R	HL	JC0463
Euphorbiaceae					
Acalypha rhomboidea Raf.	Three seeded mercury	Yes	I	HN, HL, MC	JC0586, JC0604a
Acalypha virginica L.	Virginia copperleaf	Yes	R	HL	JC0439
Euphorbia commutata Englelm.	Wood spurge	Yes	R	HL	DM0048
Euphorbia dentata Michx.	Toothed spurge	Yes	R	MC	JC0550
Euphorbia maculata L.	Spotted spurge	Yes	C	HB, HN, HL, MC, SP	JC0399, JC0448, JC0534, JC0573
Fabaceae					
Amphicarpaea bracteata (L.) Fern.	Hog peanut	Yes	R	HL, SP	JC0455
Desmodium canescens (L.) DC.	Hoary tick-trefoil	Yes	I	HN, HL, MC, SP	JC0350, JC0353
Desmodium nudiflorum (L.) DC.	Naked-flowered tick trefoil	Yes	R	HL	JC0380
Gleditsia triacanthos L.	Honey locust	Yes	I	HB, HN, HL, MC, SP	JC0540, JC0449
Gymnocladus dioica (L.) K. Koch	Kentucky coffee tree	Yes	R	HN, HL, MC	JC0447
Medicago lupulina L.	Black medick	No	C	HB, HN, HL, MC, SP	JC0024
Medicago sativa L.	Alfalfa	No	C	HB, HN, HL, MC, SP	JC0081
Melilotus alba Medikus	White sweet clover	No	C	HB, HN, HL, MC, SP	JC0093
Melilotus officinalis (L.) Pallas	Yellow sweet clover	No	C	HB, HN, HL, MC, SP	JC0068
Robinia pseudoacacia L.	Black locust	Yes	C	HB, HN, HL, MC, SP	JC0415
Trifolium campestre Schreb.	Low hop clover	No	C	HB, HN, HL, MC, SP	JM0066, JM0051
Trifolium hybridum L.	Alsike clover	No	C	HB, HN, HL, MC, SP	JC0116, JC0035
Trifolium incarnatum L.	Crimson clover	No	R	HN	JM0056
Trifolium pratense L.	Red clover	No	C	HB, HN, HL, MC, SP	JM0067, JC0076

Vicia cracca L.	Cow vetch	No	I	HN	JM0069
Fagaceae					
Fagus grandifolia Ehrh.	Beech	Yes	R	HL	JC0425
Quercus alba L.	White oak	Yes	I	HN, HL, MC	JC0571, JC0479
Quercus bicolor Willd.	Swamp white oak	Yes	I	HL, MC	JC0527, JC0565
Quercus imbricaria Michx.	Shingle oak	Yes	R	HL, MC	JC0480a, JC0409
Quercus macrocarpa Michx.	Bur oak	No	R	HL, MC, SP	JC0595
Quercus muehlenbergii Engelm.	Chinquapin oak	Yes	I	HL, SP	JC0478, JC0417, JC0515
Quercus rubra L.	Red oak	Yes	I	HB, HN, HL, MC, SP	JC0544, JC0607
Geraniaceae					
Geranium carolinianum L.	Carolina cranesbill	Yes	C	HB, HN, HL, MC, SP	JM0063, JC0239, JM0053
Geranium maculatum L.	Wild geranium	Yes	I	HL, MC	DM0051, JM0037
Hamamelidaceae					
Hamamelis virginiana L.	Witch-hazel	Yes	R	MC	JC0554, JC0248
Liquidambar styraciflua L.	Sweet gum	Yes	I	HN, HL, MC, SP	JC0362
Hippocastanaceae					
Aesculus glabra Willd.	Ohio buckeye	Yes	I	HB, HL, MC, SP	JC0287, JC0134
Hydrophyllaceae					
Hydrophyllum appendiculatum Michx.	Appendaged waterleaf	Yes	I	HL	DM0054, JC0112
Phacelia purshii Buckley	Miami mist	No	I	HN, HL	JM0057, JC0172
Iridaceae					
Sisyrinchium angustifolium Miller	Blue-eyed grass	Yes	I	HL	JC0109
Juglandaceae					
Carya cordiformis (Wang.) K. Koch	Bitternut hickory	Yes	R	HL	JC0347, JC0591
Carya ovata (Miller) K. Koch	Shagbark hickory	Yes	I	HN, HL	JC0340
Juglans nigra L.	Black walnut	Yes	C	HB, HN, HL, MC, SP	JC0361, JC0526, JC0564
Juncaceae					
Juncus tenuis Willd.	Path rush	No	R	HN, HL	JC0088, JC0138
Juncus torreyi Cov.	Rush	Yes	R	HL	JC0368
Luzula multiflora (Retz.) Lej.	Wood rush	Yes	I	HL	DM0029
Lamiaceae					
Agastache nepetoides (L.) Kuntze	Yellow giant hyssop	No	R	HL	JC0416a
Blephelia hirsuta (Purch.) Benth.	Hairy wood mint	Yes	I	HL	JC0269
Glechoma hederacea L.	Gill-over-the-ground	No	C	HB, HN, HL, MC, SP	JM0023, JC0097, JC0055

Hedeoma pulegioides (L.) Pers.	American pennyroyal	Yes	R	HL	JC0511
Lamium album L.	White dead-nettle	Yes	R	MC	JM0040
Lamium amplexicaule L.	Purple henbit	No	I	HN, MC	JM0019
Lamium purpureum L.	Purple dead nettle	No	C	HB, HN, HL, MC, SP	JM0001, JM0012, JM0017
Leonurus cardiaca L.	Motherwort	No	I	HB, HN, HL, MC, SP	JC0117, JC0601
Lycopus americanus Muhl.	Water horehound	Yes	R	HL	JC0464
Monarda fistulosa L.	Wild bergamot	Yes	I	HN, MC	JC0282, JC0298a
Nepeta cataria L.	Catnip	No	R	HB, SP	JC0262
Prunella vulgaris L.	Heal all, self heal	Yes	I	HB, HN, HL, MC, SP	JC0280, JC0329, JC0366
Teucrium canadense L.	Wild germander	Yes	C	HB, HN, HL, MC	JC0291, JC0304, JC0327
Lauraceae					
Sassafras albidum (Nutt.) Nees.	Sassafras	Yes	I	HN, HL, MC, SP	JC0227
Lentibulariaceae					
Utricularia gibba L.	Humped bladderwort	Yes	R	HL	JC0579
Liliaceae					
Allium cernuum Roth	Nodding wild onion	Yes	C	HB, HN, HL, MC, SP	JC0052
Allium tricoccum Aiton	Wild leek	Yes	R	HL, SP	JC0267
Allium vineale L.	Field garlic	No	C	HB, HN, HL, MC, SP	JC0303
Asparagus officinalis L.	Asparagus	No	I	HN, MC	JC0OP8
Camassia scilloides (Raf.) Cory	Wild hyacinth	Yes	R	HL, SP	JC0106, JC0220
Erythronium albidum Nutt.	White adder's tongue	Yes	I	HL	DM0004
Hemerocallis fulva (L.) L.	Day lily	No	I	HN, HL, SP	JC0164, JC0294
Lilium canadense L.	Canada lily	Yes	R	SP	JC0394
Ornithogalum umbellatum L.	Star of bethelehem	No	C	HB, HN, HL, MC, SP	JM0054
Polygonatum biflorum (Walter) Elliott	Solomon's seal	Yes	R	HN, HL, MC	JC0029, JC0175
Smilacina racemosa (L.) Desf.	False solomon's seal	Yes	I	HL, MC, SP	JC0319
Trillium sessile L.	Sessile trillium	Yes	I	HL	DM0018
Uvularia grandiflora J. E. Smith	Large-flowered bellwort	Yes	R	MC	JM0039, JC0626
Magnoliaceae					
Liriodenrdron tulipifera L.	Tulip tree	Yes	I	MC, SP	JC0407
Malvaceae					
Abuliton theophrasti Medikus	Velvet leaf	No	R	HN, MC	JC0467a
Hibiscus trionum L.	Flower of an hour	No	R	SP	JC0306
Malva rotundifolia L.	Cheeses	No	C	HB, HN, HL, MC, SP	JC0574
Sida spinosa L.	Prickly mallow	No	I	HB, HN, HL, MC	JC0496, JC0519
Menispermaceae					
Menispermum canadense L.	Moonseed	Yes	C	HB, HN, HL, MC, SP	JC0513

Monotropaceae					
Monotropa uniflora L.	Indian pipe	Yes	R	HL	JCNO
Moraceae					
Maclura pomifera (Raf.) Schneid.	Osage orange	No	R	HN, MC	JC0557
Morus alba L.	White mulberry	No	C	HB, HN, HL, MC, SP	JC0051, JC0225
Morus rubra L.	Red mulberry	Yes	I	HB, HN, HL, MC, SP	JC0343
Nyctaginaceae					
Mirabilis nyctaginea (Michx.) MacMillan	Heart-leaved umbrella wort	Yes	I	HN, MC	JC0208, JC0489
Oleaceae					
Fraxinus americana L.	White ash	Yes	C	HB, HN, HL, MC, SP	JC0503, JC0566, JC0617, JC0624
Fraxinus pennsylvanica Marshall	Green or red ash	Yes	C	HB, HN, HL, MC, SP	JC0308, JC0410, JC0622
Fraxinus quadrangulata Michx.	Blue ash	Yes	R	HL	JC0426
Ligustrum vulgare L.	Privet	No	R	MC	JC0628
Onagraceae					
Circaea lutetiana L.	Enchanter's nightshade	Yes	I	HL	JC0217, JC0268
Epilobium glandulosum Lehm.	Northern willow-herb	Yes	R	HL	JC0570, JC0509
Gaura biennis L.	Small flowered gaura	Yes	I	HN, MC	JC0354, JC0300, JC0418
Oenothera biennis L.	Evening primrose	Yes	I	HN, HL, MC	JC0414, JC0569
Oenothera perennis L.	Small sundrops	Yes	R	HN, HL	JC0382
Onocleaceae					
Onoclea sensibilis L.	Sensitive fern	Yes	R	HL	JC0498
Ophioglossaceae					
Botrychium dissectum Spreng.	Lace frond grape fern	Yes	R	HL	JC0588
Botrychium virginianum (L.) Swartz	Rattlesnake fern	Yes	I	HL, MC	JC0048
Orchidaceae					
Aplectrum hyemale (Muhl.) Torr.	Adam and eve	Yes	R	HL	JC0156, JC0219
Spiranthes ovalis Lindl.	Lesser ladies' tresses	Yes	R	MC	JC0633
Oxalidaceae					
Oxalis stricta L.	Yellow oxalis	Yes	C	HB, HN, HL, MC, SP	JM0050, JM0065, JC0031
Oxalis violacea L.	Violet wood-sorrel	Yes	R	HL	DM0060
Papaveraceae					
Corydalis flavula (Raf.) DC.	Corydalis	Yes	I	MC	JM0011

Dicentra cucullaria (L.) Bernh.	Dutchman's breeches	Yes	R	HL, MC	JM0026, DM0006
Papaver dubium L.	Poppy	No	R	HN	JM0058
Sanguinaria canadensis L.	Bloodroot	No	I	HL	DM0005
Phytolaccaceae					
Phytolacca americana L.	Pokeweed	Yes	C	HB, HN, HL, MC, SP	JC0255
Plantaginaceae					
Plantago lanceolata L.	Buck plantain	No	C	HB, HN, HL, MC, SP	JM0062
Plantago major L.	Common plantain	No	C	HB, HN, HL, MC, SP	JC0167a, JC0606
Plantanaceae					
Plantanus occidentalis L.	sycamore	No	I	HB, HN, HL, MC, SP	JC0135
Poaceae					
Agros tis hyemalis (Walter) BSP.	Bentgrass	Yes	R	SP	JC0284
Andropogon gerardii Vitman	Big bluestem	Yes	I	SP	JC0635
Bromus commutatus Schrader	Hairy brome	No	I	HB, HN, HL, MC, SP	JC0195, JC0077
Bromus inermis Leysser	Crab grass	No	C	MC	JC0063
Bromus tectorum L.	Downy brome grass	No	I	HN, MC	DM0013, JC0074
Chasmanthium latifolium (Michx.) Yates	Wild oats	Yes	R	SP	JC0390, JC0288
Cinna arundinacea L.	Common wood reed	Yes	I	HB, HN, HL, MC, SP	JC0469
Dactylis glomerata L.	Orchard grass	No	C	HB, HN, HL, MC, SP	JC0042
Digitaria sanguinalis (L.) Scop.	Crab grass	No	I	HB, HN, HL, MC, SP	JC0396
Echinochloa crusgalli (L.) Beauv.	Barnyard grass	No	C	HB, HN, HL, MC, SP	JC0461, JC0328, JC0348
Eleusine indica (L.) Gaertn.	Goose grass	No	I	HB, HN, HL, MC, SP	JC0363, JC0254
Elymus canadensis L.	Cananda wild rye	Yes	C	HB, HN, HL, MC, SP	JC0476, JC0403
Elymus hystrix L.	Bottlebrush grass	Yes	I	HB, HN, HL, MC, SP	JC0467
Elymus villosus Muhl.	Downy wild rye	Yes	I	HN, HL	JC0190
Elytrigia repens (L.) Nevski	Quack grass	No	C	HB, HN, HL, MC, SP	JC0349, JC0087, JC0182
Eragrostis capillaris (L.) Nees.	Lace grass	Yes	I	HL	JC0458
Festuca elatior L.	Tall fescue	No	C	HB, HN, HL, MC, SP	JC0078, JC0061
Festuca ovina L.	Sheep fescue	No	R	SP	JC0100
Festuca subverticillata (Pers.) E. Alexeev.	Nodding fescue	Yes	I	HN, HL, MC, SP	JC0108, JC0047, JC0172a
Glyceria striata (Lam.) A. Hitchc.	Foul mannagrass	Yes	R	HL	JC0146, JC0145, JC0143
Leersia virginica Willd.	White grass	Yes	I	HL, MC	JC0338a, JC0459
Muhlenbergia schreberi J. F. Gmelin.	Nimblewill	No	I	HN, HL, MC, SP	JC0541
Panicum capillare L.	Witch grass	Yes	I	HB, HN, HL, MC, SP	JC0508, JC0456
Panicum dichotomiflorum Michx.	Wiry witch grass	Yes	I	HB, HL	JC0602, JC0468a, JC0506
Panicum lanuginosum Elliot.	Panic grass	Yes	I	HB, HN, HL, MC, SP	JC0148, JC0334
Panicum latifolium L.	Grass	Yes	I	HL, SP	JC0612
Panicum virgatum L.	Switch grass	Yes	I	HN, HL, SP	JC0560, JC0398, JC0365b, JC0273
Phleum pratense L.	Timothy grass	No	C	HB, HN, HL, MC, SP	JC0086

Poa pratensis L.	Kentucky bluegrass	No	I	HB, HN, HL, MC, SP	JC0194
Poa sylvestris A. Gray	Wood bluegrass	Yes	I	MC	JC0132, JC0062
Setaria faberi R. Herrm.	Giant foxtail	No	I	HN, HL, MC, SP	JC0295, JC0395
Setaria glauca (L.) P. Beauv.	Yellow foxtail	No	C	HB, HN, HL, MC, SP	JC0480
Setaria italica (L.) P. Beauv.	Foxtail	No	I	HL	JC0593
Setaria viridis (L.) P. Beauv.	Green foxtail	No	C	HB, HN, HL, MC, SP	JC0283, JC0237, JC0599
Sorghastrum nutans (L.) Nash	Indian grass	Yes	I	HL, SP	JC0365a, JC0545, JC0475
Sorghum halepense (L.) Pers.	Johnson grass	No	C	HB, HN, HL, MC, SP	JC0241
Tridens flavus (L.) A. Hitchc.	Purpletop	Yes	C	HB, HN, HL, MC, SP	JC0532, JC0481, JC0443
Polemoniaceae					
Phlox divaricata L.	Wild blue phlox	Yes	I	HL	DM0023
Phlox paniculata L.	Garden phlox	Yes	I	MC, SP	JC0313
Polemonium reptans L.	Spreading Jacob's ladder	Yes	I	HL	DM0022, DM0016
Polygonaceae					
Polygonum aviculare L.	Doorweed	No	C	HB, HN, HL, MC, SP	JC0169, JC0575, JC0611
Polygonum cespitosum Blume	Smartweed	Yes	I	HL	JC0496A
Polygonum pensylvanicum L.	Pennsylvania smartweed	Yes	I	HB, HN, HL, MC, SP	JC0465, JC0620, JC0505
Polygonum persicaria L.	Lady's flower	No	C	HN, HL, MC	JC0428, JC0251, JC0401, JC0186
Polygonum punctatum Elliot.	Dotted smartweed	Yes	I	MC	JC0621
Polygonum scandens L.	False buckwheat	No	I	HB, HN, HL	JC0603
Polygonum virginianum L.	Jumpseed	Yes	I	HL, MC	JC0478
Rumex acetosella L.	Sheep sorrel	No	I	HB, SP	JC0095
Rumex crispus L.	Curled dock	No	C	HB, HN, HL, MC, SP	JM0061, JC0209
Rumex obtusifolius L.	Bitter dock	No	I	HN, HL	JC0211
Rumex verticillatus L.	Water dock	Yes	I	MC	JC0253
Portulacaceae					
Claytonia virginica L.	Spring beauty	Yes	C	HB, HN, HL, MC, SP	JM0025, DM0007
Potamogetonaceae					
Potamogeton nodosus Poir.	Long-leafed pond weed	Yes	R	HL	JC0546, JC0375
Primulaceae					
Lysimachia ciliata L.	Fringed loosestrife	Yes	R	MC	JC0244
Lysimachia nummularia L.	Moneywort	No	C	HB, HN, HL, MC, SP	JC0085
Samolus floribunda HBK.	Water-pimpernel	Yes	R	HL	JC0331, JC0376
Ranunculaceae					
Actaea alba (L.) Miller	Doll's eyes	Yes	R	HL	JC0320
Anemone virginiana L.	Thimble-weed	Yes	I	HL, MC, SP	JC0246
Anemonella thalictroides (L.) Spach.	Rue-anemone	Yes	I	HL, MC	DM0014

Aquilegia canadensis L.	Wild columbine	Yes	R	HL, MC	JM0036, JC0072
Clematis viorna L.	Leather-flower	Yes	R	HL	JC0242
Clematis virginiana L.	Virgin's bower	Yes	I	HN, HL	JC0451
Delphinium tricorne Michx.	Dwarf larkspur	Yes	I	HL	DM0024
Hydrastis canadensis L.	Goldenseal	Yes	R	HL	DM0053, JC0322, JC0321
Ranunculus abortivus L.	Small-leaved buttercup	Yes	C	HB, HN, HL, MC, SP	JM0028, JM0015
Ranunculus hispidus Michx.	Hispid buttercup	Yes	I	HL	DM0017
Ranunculus micranthus Nutt.	Buttercup	No	R	HL	DM0001
Thalictrum revolutum DC.	Waxy meadow rue	Yes	R	SP	JC0285
Rosaceae					
Agrimonia gryposepala Wallr.	Common agrimony	Yes	I	HL, SP	JC0338
Agrimonia parviflora Aiton	Small flowered agrimony	Yes	R	HL, SP	JC0413
Crataegus coccinea L.	Hawthorn	Yes	I	HB, MC, SP	JC0529
Crataegus crus-galli L.	Cockspur thorn	Yes	R	MC	JC0235, JC0301
Crataegus punctata Jacq.	Dotted hawthorn	Yes	R	HL	JC0427
Duchesnia indica (Andrews) Focke	Indian strawberry	No	I	HL, MC	JM0038, JC0041
Fragaria virginiana Duchesne	Wild strawberry	Yes	I	HL	DM0030
Geum canadense Jacq.	White avens	Yes	C	HB, HN, HL, MC, SP	JC0432, JC0466, JC0210
Geum vernum (Raf.) T & G	Spring avens	Yes	I	HL	DM0019
Physocarpus opulifolius (L.) Maxim.	Ninebark	Yes	R	SP	JC0598a, JC0311
Potentilla norvegica L.	Rough cinquefoil	No	I	HB, HN	JC0213, JC0261
Potentilla recta L.	Rough-fruited cinquefoil	No	I	HB, HN, HL, MC, SP	JC0236, JC0038
Prunus mahaleb L.	Cherry	No	R	MC	JC0567
Prunus serotina Ehrh.	Black cherry	Yes	I	HB, HL, MC	JC0027, JC0412
Pyrus malus L.	Apple	Yes	R	HL	JC0345
Rhodotypos scandens (Thunb.) Makino	Rhodotypos	No	R	MC	JC0600
Rosa multiflora Thunb.	Multifloral rose	No	C	HB, HN, HL, MC, SP	JC0028
Rosa setigera Michx.	Prairie rose	Yes	R	HN, HL	JC0189, JC0296
Rubus allegheniensis T. C. Porter	Common blackberry	Yes	I	HB, HN, HL, MC, SP	JC0281, JC0281
Rubus occidentalis L.	Black raspberry	Yes	C	HB, HN, HL, MC, SP	JC0224, JC0034
Rubus pensilvanicus Poiret.	Pennsylvania blackberry	Yes	I	HB, HN, HL, MC, SP	JC0408
Rubiaceae					
Galium aparine L.	Cleavers	Yes	C	HB, HN, HL, MC, SP	JM0068, DM0050, JC0069, JM0043
Galium circaezans Michx.	Wild licorice	Yes	I	HL, SP	JC0102
Galium concinnum T. & G.	Shining bedstraw	Yes	I	HL	JC0218, JC0111
Galium mollugo L.	White bedstraw	No	I	HL	JC0592
Rutaceae					
Ptelea trifoliata L.	Hop tree	Yes	R	HL, MC, SP	JC0351, JC0231

Salicaceae					
Populus deltoides Marshall	Cottonwood	Yes	I	HB, HN, HL, MC, SP	JC0625, JC0045
Saxifragaceae					
Penthorum sedoides L.	Ditch stonecrop	Yes	R	HL	JC0333
Scrophulariaceae					
Dasistoma macrophylla (Nutt.) Raf.	Mullein-foxglove	Yes	R	HL	JC0372
Mimulus alatus Aiton.	Winged monkey-flower	Yes	I	HL	JC0342, JC0336
Penstemon digitalis Nutt.	Foxglove beardtongue	Yes	I	HN, HL	JC0386, JC0091
Penstemon hirsutus (L.) Willd.	Hairy beardtongue	Yes	I	HN, HL, MC	JC0049
Scrophularia marilandica Pursh.	Maryland figwort	Yes	R	SP	JC0472
Verbascum blatteria L.	Moth mullein	No	I	HN, HL, MC	JC0073
Verbascum thapsus L.	Giant mullein	No	C	HB, HN, HL, MC, SP	JC0276
Veronica arvensis L.	Corn speedwell	No	C	HB, HN, HL, MC, SP	JC0025
Veronica officinalis L.	Common speedwell	No	C	HB, HN, HL, MC, SP	JC0096
Veronica persica Poir.	Persian speedwell	No	C	HB, HN, HL, MC, SP	JM0002, JM0003
Veronica serpyllifolia L.	Thyme-leafed speedwell	Yes	I	HB, HN, HL, MC, SP	JC0039, DM0074
Simaroubaceae					
Ailanthus altissima (Miller) Swingle	Tree of heaven	No	I	HN, MC, SP	JC0627
Smilacaceae					
Smilax ecirrhata (Engelm.) S. Wats	Catbrier	Yes	I	HB, HN, HL, MC, SP	JC0436
Smilax rotundifolia L.	Greenbrier or sawbrier	Yes	I	HB, HN, HL, MC, SP	JC0634
Solanaceae					
Datura stramonium L.	Jimson weed	Yes	I	HN, HL	JC0590, JC0497
Petunia hybrida Vilm.	Garden petunia	No	R	MC	JC0325
Physalis heterophylla Nees.	Clammy ground cherry	Yes	C	HB, HN, HL, MC, SP	JC0441
Physalis longifolia Nutt.	Long leaf ground cherry	Yes	R	HL	JC0615
Solanum carolinense L.	Horse nettle	No	C	HB, HN, HL, MC, SP	JC0131
Solanum nigrum L.	Black nightshade	Yes	I	HL, MC	JC0512
Tiliaceae					
Tilia americana L.	Basswood	Yes	I	HB, HL, MC, SP	JC0245
Typhaceae					
Typha latifolia L.	Wide leaved cat-tail	Yes	I	HL	JC0371
Ulmaceae					
Celtis occidentalis L.	Hackberry	Yes	C	HB, HN, HL, MC, SP	JC0030
Ulmus americana L.	American elm	Yes	R	HN	JC0562

Ulmus pumila L.	Chinese elm	No	I	HN, MC	JC0420, JC0234
Ulmus rubra Muhl.	Slippery elm	Yes	C	HB, HN, HL, MC, SP	JC0423, JC0411, JC0522, JC0430
Urticaceae					
Boehmeria cylindrica (L.) Swartz	False nettle	Yes	I	HB, HN, HL, MC, SP	JC0454, JC0492, JC0377
Laportea canadensis (L.) Wedd.	Wood nettle	Yes	I	HB, HN, MC	JC0491
Pilea pumila (L.) A. Gray	Clearweed	Yes	C	HB, HN, HL, MC, SP	JC0504
Urtica dioica L.	Tall nettle	Yes	I	HN, HL, MC	JC0126, JC0450
Valerianaceae					
Valerianella chenopodifolia (Purch.) DC.	Great lakes corn salad	Yes	I	HN, MC	JM0033
Valerianella locusta (L.) Betcke.	Blue corn-salad	No	I	MC	JM0048
Verbenaceae					
Phryma leptostachya L.	Lopseed	Yes	R	HL, MC, SP	JC0339, JC0309
Verbena hastata L.	Blue vervain	Yes	R	HN	JC0279
Verbena urticifolia L.	White vervain	Yes	I	HB, HN, HL, MC, SP	JC0323
Violaceae					
Viola palmata L.	Early violet	Yes	R	HL	DM0078
Viola pubescens Aiton	Smooth yellow violet	Yes	I	HL	JC0216, DM0020
Viola rafinesquii Greene	Field pansy	Yes	I	HN, MC	JM0010, DM0010
Viola sororia Willd.	Common blue violet	Yes	C	HB, HN, HL, MC, SP	JC0059, DM0075, JM0027, JM0024
Viola striata Aiton	Striped violet	Yes	I	HL, SP	JC0103, DM0025
Vitaceae					
Parthenocissus quinquefolia (L.) Planchon	Virginia creeper	Yes	C	HB, HN, HL, MC, SP	JC0563
Vitis aestivalis Michx.	Summer grape	No	I	HN, MC, SP	JC0539
Vitis riparia Michx.	River grape	Yes	C	HB, HN, HL, MC, SP	JC0252
Vitis vulpina L.	Fox grape	Yes	I	HB, HN, HL, MC, SP	JC0523, JC0535

DISCUSSION

Floristic Summary

A floristic summary of the taxa for the park is shown in Table 1. The distribution of taxa by group is fairly typical for North America. Most of the species are angiosperm dicots. The total number of taxa represents 40% of the species, 57% of the genera, and 76% of the families of Ross County. Representation in the flora of Ohio is 17% of the species, 35% of the genera, and 56% of the families.

Table 1. Floristic summary of plant taxa of Hopewell Culture National Historical Park.

Group	Families	Genera	Species		
			Native	Introduced	Total
Pteridophytes	6	6	7	0	7
Gymnosperms	1	1	1	0	1
Angiosperms	*86*	*274*	*288*	*142*	*430*
Monocots	12	49	60	25	85
Dicots	74	225	228	117	345
Total	93	281	296	142	438

Introduced species constitute 32% of the total number at the park. This is relatively high, but similar to other parks in the midwestern U. S. (Bennett, 1996).

The Hopewell unit had the greatest number of species with 348. This was followed by the Mound City unit with 268, Hopeton with 238, Seip with 219 and High Banks had the lowest with 175 species. These numbers roughly correspond with the acreages of the units.

Completeness Estimate

We estimate the percent completeness of the park's flora at 92%. The remaining 8% are probably a combination of the following:

- Species from earlier lists that were not found in this survey
- Unidentified specimens (about 10)
- Grasses and sedges - these are difficult groups to sample
- Spring ephemerals - this part of the flora was undersampled in three units, and not sampled at all in High Banks and Seip

Field work following this survey should concentrate on these groups in order to complete the flora.

Ohio Threatened and Endangered Species

Two species were collected that are on the 1994-95 Ohio Department of Natural Resources Rare Native Ohio Plant List (1994):

Eleocharis ovata (Roth) Roemer & Schultes is listed as a state endangered species. Two specimens (JC0147 and JC0385) were found at Hopewell Unit along the old logging road in a recently logged area approximately 300 meters east of the northwestern entrance of the forest. They were standing in saturated soil near many other plants of the *Cyperaceae* family. It should be noted that we are using the definition of this species according to Gleason and Cronquist (1991), which includes *Eleocharis obtusa* (Willd.) Schultes within

the taxon. A. Cusick considers the specimen to be the latter and quite common throughout the state. The *E. ovata* that does not include *E. obtusa* is quite rare and is only found in the northern part of the state.

Spiranthes ovalis Lindl. var. ***erostellata*** Catling. (JC0633) is listed as a state potentially threatened species. It was formerly listed as state threatened species but recent findings indicate it may more frequent in southern Ohio than previously thought (Catling, 1983). One specimen was found 20 feet east of the service road in the Mound City unit in an open area in moist early successional woods.

Ross County Records

The following 65 species are new records for Ross County:

Agrostis hyemalis (Walter) BSP.
Allium cernuum Roth
Allium tricoccum Aiton
Allium vineale L.
Aplectrum hyemale (Muhl.) Torr.
Berteroa incana (L.) DC.
Bromus inermis Leysser
Cardamine douglasii Britton
Carduus nutans L.
Carex albicans Willd.
Carex amphibola Steudel
Carex blanda Dewey
Carex careyana Torr.
Carex flaccosperma Dewey
Carex gracillima Schwein.
Carex laxiculmis Schwein.
Carex retroflexa Muhl.
Carex shortiana Dewey
Carex squarrosa L.
Carex vulpinoidea Michx.
Cinna arundinacea L.
Cucurbita pepo L.
Desmodium nudiflorum (L.) DC.
Elaeagnus angustifolia L.
Elymus canadensis L.
Elytrigia repens (L.) Nevski
Epilobium glandulosum Lehm.
Eragrostis capillaris (L.) Nees.
Erythronium albidum Nutt.
Euonymus alatus (Thunb.) Siebold
Eupatorium serotinum Michx.
Festuca elatior L.
Festuca ovina L.
Festuca subverticillata (Pers.) E. Alexeev.
Hemerocallis fulva (L.) L.
Hesperis matronalis L.
Hibiscus trionum L.
Hieracium caespitosum Dumort
Lactuca canadensis L.
Lamium album L.

Ligustrum vulgare L.
Lilium canadense L.
Liquidambar styraciflua L.
Lonicera maackii (Rupr.) Maxim.
Lonicera tartarica L.
Malva rotundifolia L.
Matricaria maritima L.
Mimulus alatus Aiton.
Ornithogalum umbellatum L.
Osmorhiza longistylis (Torr.) D. C.
Panicum latifolium L.
Petunia hybrida Vilm.
Plantago major L.
Prunus mahaleb L.
Rhodotypos scandens (Thunb.) Makino
Rubus pensilvanicus Poiret.
Setaria faberi R. Herrm.
Setaria italica (L.) P. Beauv.
Silene latifolia Poiret
Smilax ecirrhata (Engelm.) S. Wats
Spiranthes ovalis Lindl.
Ulmus pumila L.
Utricularia gibba L.
Vinca minor L.
Vitis riparia Michx.

These records are based on the county dot maps in Braun (1967), Cooperrider (1995), Fisher (1988), unpublished maps of J. Furlow, and the county presence data in Cusick and Silberhorn (1977). No specimens were collected of species that were new to the state of Ohio.

Management Recommendations

The populations of two species should be monitored by the park because they are rare and have been given special statuses: *Eleocharis ovata* and *Spiranthes ovalis*. The first was found in the Hopewell unit, the latter in the Mound City unit. The *Eleocharis* was found in wet soil along the old road, which might make it vulnerable if the road is used. The *Spiranthes* was found near the nature trail and along the service road and will probably be protected. Specific advice on the management of these three species should be sought from the Ohio Department of Natural Resources Division of Natural Areas and Preserves in Columbus.

Of the five units of the park, the Hopewell Mound Group unit contains the highest plant diversity, followed by Mound City, Hopeton, Seip and High Banks in that order. Management for this diversity should emphasize protection and conservation of the units in the same order.

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